Cancer survivors' exercise barriers, facilitators andpreferences in the context of fatigue, quality of life andphysical activity participation: a questionnaire–survey.

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Cancer survivors' exercise barriers, facilitators and preferences in the context of fatigue, quality of life and physical activity participation: a questionnaire–survey

J. M. Blaney[1], A. Lowe-Strong[1], J. Rankin-Watt[2], A. Campbell[3] and J. H. Gracey[1]*
[1]*Health and Rehabilitation Sciences Research Institute, University of Ulster, Newtownabbey, Co. Antrim, UK*
[2]*Physiotherapy Department Belvoir Park Suite, Cancer Centre, Belfast City Hospital, Belfast, Co. Antrim, UK*
[3]*University of Dundee, Nethergate, Dundee, UK*

**Correspondence to: Room 1F116, Health and Rehabilitation Sciences Research Institute, University of Ulster, Newtownabbey, Co. Antrim, UK, BT 37 0QB. E-mail: jh.gracey@ulster.ac.uk*

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Abstract

***Objective*: To investigate the exercise barriers, facilitators and preferences of a mixed sample of cancer survivors as well as fatigue levels, quality of life (QoL) and the frequency and intensity of exercise that cancer survivors typically engage in.**

***Methods*: An anonymous, postal questionnaire–survey with a convenience sample of 975 cancer survivors was used. Standardised measures were used to establish fatigue (Multidimensional Fatigue Symptom Inventory-Short Form), QoL (European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire-C30), exercise frequency and intensity (Leisure Score Index).**

***Results*: A 52.3% response rate ($n = 456$) was achieved. A total of 76.0% were female, with stage I (18.3%) or stage II (21.0%) breast cancer (64.4%), and 62.3% were ≥3 years post treatment. A total of 73.5% reported fatigue with 57.2% experiencing fatigue on a daily basis. A total of 68.1% had never been given any advice on how to manage fatigue. A total of 9.4% reported to engage in strenuous physical activity, 43.5% in moderate physical activity and 65.5% in mild physical activity. Respondents experienced difficulties with emotional, cognitive and social functioning and the symptoms of fatigue, insomnia and pain. Barriers that interfered with exercise 'often/very often' were mainly related to respondents' health and environmental factors. A total of 50.2% were interested in exercise and 52.5% felt able to exercise. Exercise facilitators, preferences and motivators provide some insight into cancer survivors' needs in terms of becoming more physically active.**

***Conclusions*: Although cancer survivors continue to experience fatigue and QoL issues long after treatment completion, over half are willing and feel able to participate in exercise. Exercise barriers were mainly health related or environmental issues, however, the main barriers reported were those that had the potential to be alleviated by exercise.**

Keywords: oncology; cancer; exercise; barriers; facilitators; preferences

Introduction

Randomised controlled trials investigating the benefits of exercise for cancer survivors have reported many significant health improvements. Although findings mainly relate to breast cancer survivors, results to date are positive and include the following: decreased cancer-related fatigue (CRF) [1–8], improvements in cardiorespiratory/aerobic fitness [3,5,7], muscular strength [3,4,7], physical functioning [1,4,8–11] and Quality of Life (QoL) [3,6–8]. Furthermore, studies have shown that exercise may reduce the risk of cancer recurrence and increase survival rates in breast and colorectal cancer populations [12–15].

Despite these important gains, cancer survivors' physical activity levels are thought to decline by at least one third following diagnosis [16] and are often not recovered several years post treatment [17]. In fact, only 29.6% of cancer survivors [18] are meeting the American Cancer Society's and Public Health's guidelines of 150 min of moderate intensity exercise per week [19,20].

The factors associated with this decline and low rates of exercise participation are not fully established. A contributing aspect may be that exercise and its benefits are not routinely discussed with cancer survivors [21]. Additional factors may be the unique exercise barriers that cancer survivors' face. Although similar to that of the general population [22], the greater majority of cancer survivors' exercise barriers are specifically related to disease and treatment side effects [23–25]. CRF presents as one of the main and most commonly reported exercise barriers [22,24,26]. Although some studies suggest that fatigue tends to return to baseline levels post treatment [27–29], others report that fatigue is still present in the months and years after treatment has

been completed [30–33], impacting significantly on survivors' QoL [34].

Research into cancer survivors' exercise barriers [22–24,35,36], facilitators and preferences [35,37–42] is relatively novel and further work is warranted for several reasons. Firstly, it is important to establish the exercise barriers, facilitators and preferences among the wider survivor population. Studies to date have been mainly comprised of, or focused on breast cancer survivors [24,35,36,39]. Secondly, post treatment, individuals can focus on lifestyle change, yet may often feel removed from supportive care and are at a phase when the self-management of symptoms is required, thus are a cohort who may face and experience the most barriers. Much of the research, however, has focused on exercise barriers during treatment [22–24,26] with over half of these studies undertaken with cancer survivors participating in an exercise trial [22–24]. Considering exercise programmes and the support and advice of exercise specialists are not routinely offered to cancer survivors [43], these findings may not be representative of the broader cancer population.

This study will take a comprehensive approach to establish cancer survivors' exercise barriers, preferences and facilitators in the context of existing fatigue levels as well as QoL status, providing some insight into survivorship needs, particularly in terms of becoming more physically active. Based on the previous research in this area and a qualitative study that preceded this survey [25], it is hypothesised that cancer survivors will continue to experience CRF and decreased QoL several years after the completion of treatment with fatigue as a major barrier to exercise. It is further hypothesised that the majority of cancer survivors will not have been given advice on the management of CRF and will not engage in regular moderate intensity exercise.

Methods and materials

Design

This study was an anonymous, postal questionnaire–survey of cancer survivors.

Participants and setting

Ethical approval was granted by the University of Ulster's Research Ethical Committee, in September 2008. Participants were a convenience sample of 1001 cancer survivors who were service users of a supportive care cancer charity in Northern Ireland, which has a population of 1.7 million. Contact was made with senior management of the charity who agreed to facilitate the distribution of the questionnaire. To ensure questionnaires were anonymous and to allow for identification of non-responders, all individuals were assigned with an identification (ID) number by the organisations' secretary.

Measures

The content of the questionnaire was developed from a qualitative study that explored the exercise barriers, preferences and facilitators across the cancer trajectory through Social Cognitive Theory constructs [25] and from the available literature in this area [22,23,26,35–37,41,42]. The questionnaire was comprised of four sections, which included three standardised measures. CRF was measured using the Multidimensional Fatigue Symptom Inventory–Short Form (MFSI-SF) [44] and QoL using the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire –C30 (EORTC QLQ-C30) [45]. Exercise frequency and intensity were captured using the Leisure Score Index (LSI) of the Godin Leisure-Time Exercise Questionnaire [46].

Procedures

Pilot questionnaire

Pretesting of the questionnaire was undertaken to minimise bias, ensure the range of responses for each question were adequate and ascertain the acceptability of the questionnaire. The pilot questionnaire was distributed to 75 individuals systematically sampled from the 1001 survivors on the charity's database. This sample was excluded from the main questionnaire distribution.

Twenty-six (34.7%) cancer survivors completed the pilot questionnaire and 22 returned feedback. Almost all respondents found the questionnaire easy to understand ($n = 20$), did not find it too long ($n = 20$) and did not dislike any of the questions ($n = 21$). Due to respondents often missing/not completing all of the items on the MFSI-SF and the EORTC QLQ-C30, it was decided that increasing the line spacing between items and separating them by alternate shading may aid the completion of the measures in full. Additional questions regarding fatigue management advice were also added into the main questionnaire.

Main questionnaire

A modified Total Design Method [47] was employed to increase the quality and quantity of response. Prior to the main questionnaire distribution, 926 cancer survivors were sent an information sheet outlining the background and purpose of the questionnaire–survey, details of the research team, what participation entailed and when to expect questionnaire delivery. The main mailing included the finalised questionnaire, cover letter, participant information sheet and a stamped addressed envelope. Each questionnaire had an ID number on the cover that corresponded with the database. Once the participants returned the questionnaire, they were removed from the mailing list. Allowing a 3 week response time, the second mailing of the questionnaire was distributed to non-responders.

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Data analysis

Questionnaires were entered onto SPSS (version 15; SPSS Inc., Chicago, IL, USA), verified for accuracy of input and analysed using descriptive statistics. Missing data from the MFSI-SF and the EORTC QLQ-C30 were imputed using simple mean imputation when at least 50% of the subscale data were present [48]. All continuous data had a non-normal distribution that did not improve with the appropriate transformation calculations and are therefore reported as medians with interquartile range (IQR).

Results

Participant characteristics

A total of 456 cancer survivors responded. Fifty-five questionnaires were identified as invalid (19 deceased, 5 not addressee and 31 healthcare professionals or cancer survivor's relative), providing a valid response rate of 52.3%.

Table 1 details participants' medical and demographic information. The median age of the respondents was 61 years (IQR 15), and the majority of the sample were female (76.0%), married (70.9%) and retired (56.6%). The most common diagnoses were breast (64.4%) and prostate (12.4%) cancer. A total of 38.6% were unaware of their cancer staging, whereas the remaining sample reported to have Stage I (18.3%) or Stage II (21.9%) disease. The respondents' median BMI was 29.04, and the majority were classified as either overweight (39.8%) or obese, class I–III (35.8%). A total of 83.0% had completed treatment and 69.2% had undergone surgery plus anti-cancer treatments.

Table 1. Respondents' demographic and medical information

Demographics	*N*	(%)
Marital status	**454**	
Married	322	**70.9**
Widowed	43	9.5
Single	40	8.8
Divorced	27	5.9
Separated	15	3.3
Living with partner	7	1.5
Employment status	**454**	
Retired	257	**56.6**
Part-time	55	12.1
Full-time	50	11.0
Long-term sick leave	41	9.0
Homemaker	36	7.9
Unemployed	13	2.9
Other (Disabled)	2	0.4
Body Mass Index	**432**	
Normal (18.5–24.99)	105	24.3
Overweight (25.0–29.99)	172	**39.8**
Obese Class I (30.0–34.99)	87	20.1
Obese Class II (35.0–39.99)	48	11.1
Obese Class III (40.0+)	20	4.6
Diagnosis	**452**	
Breast	291	**64.4**
Prostate	56	12.4
Throat	36	8.0
Non-Hodgkin's lymphoma	23	5.1
Lymphoma	11	2.4
Multiple myeloma	10	2.2
Colorectal	7	1.5
Ovarian	4	0.9
Leukaemia	4	0.9
Myeloma	3	0.7
Hodgkin's lymphoma	2	0.4
Sarcoma	2	0.4
Cervical	1	0.2
Brain	1	0.2
Testicular	1	0.2
Staging	**438**	
Stage I	80	18.3
Stage II	96	21.9
Stage III	73	16.7
Stage IV	20	4.6
Don't know	169	**38.6**
Treatment received	**452**	
Surgery alone	65	14.4
Chemotherapy alone	31	6.9
Radiotherapy alone	30	6.6
Chemotherapy and radiotherapy	13	2.9
Surgery and chemotherapy ± radiotherapy	306	**67.7**
Other	7	1.5
Time since completion of treatment	**344**	
<1 year	38	11.0
1–2 years	92	**26.7**
3–4 years	66	19.2
5–7 years	65	18.9
8–10 years	35	10.2
>10 years	48	14.0

Boldface indicates the majority response.

Fatigue and quality of life

Table 2 presents the frequency and intensity of fatigue experienced by the respondents and the fatigue advice provided. A total of 73.5% reported fatigue, with 57.2% experiencing fatigue on a daily basis. Although 68.1% had not been given any fatigue management advice, the remaining respondents were most commonly advised to exercise/keep active (68.0%), rest/sleep (64.5%) and pace activities (57.4%). Respondents scored highest in the domain of general fatigue (12; IQR 10) with a median total fatigue score of 27 (IQR 32).

Median scores on the EORTC QLQ-C30 suggest that the main symptoms that the cancer survivors experienced were in relation to fatigue, insomnia and pain (Table 3). Scores indicate a higher level of physical functioning and role functioning in contrast to emotional, cognitive and social functioning.

Physical activity levels and exercise barriers

Using the LSI of the Godin Leisure Time Exercise Questionnaire (Table 4), the respondents were asked to indicate how many times per week they engaged in strenuous, moderate and mild exercise (>15 min during free time). A total of 9.4% engaged in strenuous physical activity, 43.5% in moderate physical activity and 65.5% in mild physical activity, with 54.8% stating they rarely/never engaged in physical activity long enough to work up a sweat.

The top 10 barriers that interfere 'often/very often' with exercise participation were illness/other health

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Table 2. Frequency and intensity of fatigue experienced by respondents and fatigue advice provided

Fatigue frequency and advice provided	*N*	(%)
Currently experiencing fatigue	**453**	
Yes	333	**73.5**
No	120	26.5
Frequency of fatigue	**320**	
Daily	183	**57.2**
Every other day	69	21.6
Weekly	31	9.7
Fortnightly	8	2.5
Monthly	16	5.0
Other	13	4.1
Fatigue advice given	**442**	
No	301	**68.1**
Yes	141	31.9
Fatigue advice provided by	**141**	
Nurse	54	**38.3**
GP	44	31.2
Oncologist	26	18.4
Physiotherapist	24	17.0
Other	46	32.6
Format of advice	**141**	
1–2–1 Consultation	106	**75.2**
Information leaflet	48	34.0
Other	27	19.1
Recommended advice	**141**	
Exercise/keep active	96	**68.0**
Rest/sleep	91	64.5
Pacing	81	57.4
Other	23	16.3
Fatigue intensity (MFSI-SF)	Median	Percentiles
Physical fatigue	8.0	4.0, 13.3
Mental fatigue	8.0	5.0, 14.0
Emotional fatigue	7.5	4.0, 13.0
Vigour	8.0	5.0, 11.3
General fatigue	12.0	7.0, 17.0
Total fatigue	27.0	13.0, 45.0

MFSI-SF, Multidimensional fatigue symptom inventory–short form.
Boldface indicates the majority response.

Table 3. Respondents' quality of life scores (EORTC QLQ-C30)

	N	Median	Percentiles
Quality of life			
Global health status	443	66.7	50.0, 83.3
Global QoL status	442	66.7	50.0, 83.3
Functional scales			
Physical	445	80.0	53.3, 93.3
Role	443	83.3	50.0, 100
Emotional	445	66.7	50.0, 83.3
Cognitive	447	66.7	50.0, 83.3
Social	441	66.7	33.3, 100
Symptom scales/items			
Fatigue	444	33.3	22.2, 55.7
Nausea/vomiting	441	0	0, 16.7
Pain	444	16.7	0, 50.0
Dyspnoea	444	0	0, 33.3
Insomnia	443	33.3	0, 66.7
Appetite loss	437	0	0, 33.3
Constipation	446	0	0, 33.3
Diarrhoea	440	0	0, 33.3
Financial difficulties	442	0	0, 33.3

EORTC QLQ-C30, European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire –C30; QoL, quality of life.

Table 4. Leisure score index

Intensity and frequency of exercise (times/week)	*N*	(%)
Strenuous	**449**	
None	407	**90.6**
1	12	2.7
2	12	2.7
3	8	1.8
4	4	0.9
≥5	6	1.3
Moderate	**448**	
None	253	**56.5**
1	38	8.5
2	48	10.7
3	41	9.2
4	17	3.8
≥5	51	11.3
Mild exercise	**447**	
None	154	**34.5**
1	50	11.2
2	62	13.9
3	62	13.9
4	27	6.9
≥5	92	20.5
Engage in activity long enough to work up a sweat?	**447**	
Often	45	10.1
Sometimes	157	35.1
Never/rarely	245	**54.8**

Boldface indicates the majority response.

problems (37.3%), joint stiffness (36.9%), fatigue (35.7%), pain (30.1%), lack of motivation (26.5%), weather extremes (26.2%), lack of facilities (25.5%), weakness (21.5%), lack of interest (20.7%) and fear of falling (19.5%).

Exercise preferences and facilitators

Table 5 displays respondents exercise programme preferences. A total of 50.2% were interested and 52.5% felt able to take part in an exercise programme. Of those suffering from fatigue, 50.7% stated they would either be unable to exercise or were unsure of their exercise ability. The most commonly preferred activities were walking (76.7%), strengthening exercises (36.0%), flexibility exercises (32.3%), swimming (32.3%) and yoga (27.3%). A total of 60.2% of respondents preferred moderate intensity exercise and 32.7% stated they would prefer to exercise for 20–30 min per session. Most were interested in attending an exercise programme once (34.7%) or twice (32.0%) per week. Morning exercise was the most common choice with regards time of day (36.6%), followed by afternoon (21.9%) or evening (16.2%), whereas 21.6% indicated no preference. A total of 38.8% had no preference as to where the exercise programme was held. Those with a preference for venue, most commonly chose a leisure centre (24.8%). Just over 40% preferred to exercise with other cancer survivors, and 37.4% were unsure as to who should deliver an exercise programme. The large majority advocated initiating an exercise programme post treatment, with the most common timeframe being ≥1 year (33.9%), followed by 0–6 months (29.6%).

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Table 5. Respondents' exercise preferences

Exercise preferences	N	(%)
Are you interested in taking part in an exercise programme?	442	
Yes	222	**50.2**
No	105	23.8
Not sure	115	26.0
Do you feel you could take part in an exercise programme?	436	
Yes	229	**52.5**
No	76	17.4
Not sure	131	30.1
What type of exercise would you be most interested in?	433	
Walking	332	**76.7**
Strengthening exercises	156	36.0
Flexibility exercises	140	32.3
Aerobic exercises	70	16.2
Swimming	140	32.3
Circuit training	23	5.3
Yoga	118	27.3
Tai chi ($n = 432$)	64	14.8
Pilates ($n = 432$)	92	21.3
No preference	24	5.5
What intensity would you like to exercise at?	420	
Light	101	24.0
Moderate	253	**60.2**
Light or moderate	2	0.5
Moderate or vigorous	2	0.5
Vigorous	22	5.2
No preference	40	9.5
How long do you think you would be able to exercise for?	416	
Less than 10 min	33	7.9
10–20 min	120	28.8
20–30 min	136	**32.7**
Over 30 min	126	30.3
Not sure	1	0.2
How often would you be interested in attending?	412	
Once a week	143	**34.7**
Twice a week	132	32.0
Three times a week	68	16.5
More than three times a week	11	2.7
No preference	58	14.1
What time of the day would you prefer to exercise?	421	
Morning	154	**36.6**
Afternoon	92	21.9
Morning or afternoon	12	2.9
Afternoon or evening	4	1.0
Evening	68	16.2
No preference	91	21.6
When would you prefer to have started an exercise programme?	389	
Before treatment	31	8.0
During treatment	25	6.4
0–6 months after completion of treatment	115	29.6
7–12 months after completion of treatment	82	21.1
One year or more after completion of treatment	132	**33.9**
Not sure	3	0.8
No preference	1	0.3
Who would you prefer to exercise with?	424	
Alone	67	15.8
Other cancer survivors	173	**40.8**
General public ($n = 423$)	32	7.6
Family	47	11.1
Friends	88	20.8
No preference ($n = 423$)	111	26.2
Other	4	0.9
Who would you prefer your exercise was delivered by?	423	
Specialist nurse	65	15.4
Physiotherapist	86	20.3
Other healthcare professional	29	6.9
Fitness instructor	111	26.2
Not sure	158	**37.4**
Other	34	8.0
Where would you prefer an exercise programme to take place?	424	
Home	64	15.1
Cancer centre	72	17.0
Community centre	61	14.4
Leisure centre ($n = 423$)	105	24.8
No preference ($n = 423$)	164	**38.8**
Not sure	25	5.9
How would you like to receive information on available exercise programmes for cancer survivors?	426	
Telephone	48	11.3
Email	66	15.5
Post	288	**67.6**
Flyer	31	7.3
No preference	68	16.0
Who would you like to receive this information from?	423	
Oncologist	78	18.4
Specialist nurse	148	**35.0**
Practice nurse	51	12.1
Physiotherapist	106	25.1
GP	65	15.4
Other healthcare professional	61	14.4
No preference ($n = 339$)	51	15.0

Boldface indicates the majority response.

Most preferred to receive information about an exercise programme by post (67.6%), from a specialist nurse (35.0%) or physiotherapist (25.1%).

The top 10 factors that respondents 'agreed' or 'strongly agreed' would facilitate exercise participation was a programme that was: fun (88.0%), included a variety of exercises (81.8%), gradually progressed (78.9%), flexible (75.5%), involved personal goal setting (73.9%), included good music (73.2%), tailored to the individual (73.1%), included feedback (66.2%) and approved by their oncologist (65.7%) or GP (60.3%). The main motivators of exercise were to improve QoL (64.5%) and get fit (60.4%), whereas managing fatigue came fourth (50.9%). The main perceived benefit of exercise was an improved sense of well-being (86.7%), followed by a sense of achievement (54.0%).

Discussion

This study explored cancer survivors' exercise barriers, facilitators and preferences in the context of existing fatigue levels, QoL status and reported on the frequency and intensity of exercise that cancer survivors typically engage in.

Fatigue and quality of life

As hypothesised, findings show that fatigue is a very prevalent and chronic symptom among cancer survivors that remains under-diagnosed and under-treated [49]. Over two thirds of the sample had never been given any advice on fatigue management. A similar questionnaire–survey reported that only 14% of cancer survivors had been given recommendations on how to control fatigue [50] and suggests that patient education has not advanced much over more recent years. On the other hand, fatigue is a symptom that patients do

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not commonly discuss with their hospital doctor [50–52] even though results from the EORTC QLQ-C30 when compared with non-cancer reference values suggests that fatigue, pain and insomnia are the most problematic symptoms experienced. Furthermore, the literature suggests that healthcare professionals experience barriers to managing CRF. Donnelly and colleagues [53] found that 71% of physical therapists identified the lack of exercise guidelines as a barrier to prescribing exercise as well as a lack of resources (51%) and low-referral rates (49%). Although the National Comprehensive Cancer Network [49] provides advice on fatigue screening and promotes physical activity enhancement, it is apparent that clear guidelines for health professionals are needed.

Physical activity levels and exercise barriers

Irrespective of cancer stage and time since treatment completion, results from the LSI confirm our hypothesis that the majority of cancer survivors are not engaging in moderate intensity exercise. Previous research reports that 68%–70% of cancer survivors are not sufficiently active [18,54,55] which are bleak statistics considering the potential benefits that may be gained.

Although there may be an element of poor patient education surrounding the benefits of exercise participation and a lack of advice, undoubtedly, cancer survivors' perceived exercise barriers play a major role. The main exercise barriers that cancer survivors reported can be largely attributed to health or treatment related factors such as illness/other health problems, joint stiffness, pain, weakness and as predicted, fatigue. Environmental factors such as lack of facilities for cancer survivors, weather extremes, motivational factors and safety concerns were also highlighted as important issues.

The majority of cancer survivors had completed treatment $\geq$3 years previously which highlights the fact that treatment and health related issues, in particular fatigue, can present as exercise barriers long after treatment has ended. In addition, it underlines the importance of extended supportive care for cancer survivors. Two previous studies [23,24] explored the exercise barriers of survivors who had been participating in an exercise intervention study. Courneya *et al.* [23] suggest that exercise barriers should be assessed while motivation is present and among cancer survivors who are trying to exercise, thus eliciting 'true' barriers as opposed to 'reasons or excuses'. This may be a relevant point, however, such barriers may not be representative of the general cancer population. Individuals in these studies had an exercise prescription, guidance and motivational support mechanisms in place; unfortunately, this is not common place for most cancer survivors [43], and the results of the current study reflect that not all cancer survivors are indeed motivated to exercise. Lack of facilities for cancer survivors, lack of motivation and safety issues were within the top 10 exercise barriers that interfered 'often/very often'. Such barriers would be more representative of the general cancer population who would be initiating and maintaining exercise independently.

Exercise preferences and facilitators

Considering participants in this study reported numerous barriers to exercise and the fact that most were experiencing daily fatigue, it is encouraging that over 50% indicated that they would be interested in taking part in exercise and indeed felt capable. Similar studies report ranges of between 33.0%–69.0% of cancer survivors are interested in exercise and 46.4%–65.1% feel capable [37–39,41,42]. Like previous research, the most popular activities were walking and strengthening exercises [35–39,41,42,55]. Most respondents in the current study preferred to exercise in the morning and at a moderate intensity, which is also consistent with previous work [35,36,38–42]. In contrast, however, most of the sample that had a preference, stated that they preferred to exercise in a leisure centre, delivered by a fitness instructor, among other cancer survivors and 1 year or more after the completion of treatment. The consensus within the literature is that cancer survivors prefer to exercise at a cancer centre [41], outdoors [39] or at home [35–37,39,40,42], alone/unsupervised [36,38,39,42] or with family/friends [40]. Those studies that reported timing of exercise initiation, the majority preferred 3–6 months post-treatment [39–42] or before treatment [36]. Because there are mixed opinions as to the most preferred exercise delivery and setting, perhaps the most appropriate recommendation would be to offer a group and hospital/community based exercise programmes with a home-based option, particularly if cancer survivors are to achieve the recommended physical activity guidelines [19,20].

Most cancer survivors suggested that motivational elements and strategies such as exercise being fun, incorporating music and variety, progressed, involving goal setting and feedback would facilitate them to exercise. Health-related factors that were of importance were exercise programmes being tailored to each individual and approved by their oncologist and GP. Evidence suggests that oncologists play an important role in enhancing exercise levels among cancer survivors [56]. This may be associated with the fact that cancer survivors have concerns regarding exercise safety post treatment.

Motivational factors were mainly related to improving QoL and becoming fitter, while the main perceived benefits of exercise were improved well-being and a sense of achievement. The fact that managing fatigue came forth as a motivator, even though fatigue was experienced by the majority and one of respondents' main barriers, again highlights the lack of education and information provision. Overall, our findings show that exercise facilitators, preferences and motivators are related to cancer survivors' needs.

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Study limitations

This was a convenience sample of cancer survivors from Northern Ireland with mainly stage I or II breast cancer who were users of a supportive care cancer charity and as such findings may not be generalisable to the wider cancer population. In addition, this may be a subgroup of cancer survivors who were more likely to seek services and more proactive in addressing their needs and possibly a group who experienced greater survivorship issues. The presence of other illnesses, for example, fibromyalgia, multiple sclerosis and chronic depression are known to be associated with fatigue, and as information was not collected on respondents' comorbidities, it is possible that respondents were not suffering solely from CRF. Furthermore, the presence of comorbidities may also have impacted on respondents' QoL, exercise interest, barriers and preferences. Because the LSI only measures frequency and intensity of exercise, it was not possible to ascertain the proportions of cancer survivors meeting the public health guidelines for physical activity. This notwithstanding, the majority were engaging in no moderate intensity exercise. Because the majority of respondents had completed treatment several years earlier, there may be an element of recall bias in relation to the fatigue management advice.

Future questionnaire–surveys of cancer survivors should address the limitations of the current study by including a wide variety of cancer diagnoses and staging with equal representation, thus, ensuring data are more generalisable. One potential route to achieve this is to use cancer registry data to sample and select cancer survivors. Future research should also take into account comorbidity data when interpreting cancer survivors fatigue and QoL. Studies examining physical activity levels of cancer survivors should note the limitations of the LSI and consider using questionnaires that capture frequency, intensity and duration of exercise participation.

Conclusion

It is estimated that two million people in the UK are living with a diagnosis of cancer [57] and the chronic consequences of its subsequent treatment. In support of this, the current study shows that cancer survivors continue to experience problems with fatigue, insomnia, pain and elements of functioning long after the completion of treatment. Contributing to this problem may be the fact that few cancer survivors are engaging in moderate intensity exercise. Barriers to exercise were mainly health related or environmental issues, however, the main barriers reported are those that could also be alleviated by exercise. The evidence presented in this study should contribute to the development of future exercise intervention studies and rehabilitation programmes for cancer survivors. Such programmes, better patient education and the promotion of exercise among key healthcare professionals may assist cancer survivors toward a more active lifestyle.

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Conflict of interest

None

References

1. Chang P, Lai Y, Shun S *et al*. Effects of a walking intervention fatigue-related experiences of hospitalized acute myelogenous leukemia patients undergoing chemotherapy: a randomized controlled trial. *J Pain Symptom Manage* 2008;**35**:524–534.
2. Hwang JH, Chang HJ, Shim YH *et al*. Effects of supervised exercise in therapy patients receiving radiotherapy for breast cancer. *Yonsei Med J* 2008;**49**:443–450.
3. Milne HM, Wallman KE, Gordon S, Courneya KS. Effects of a combined aerobic and resistance exercise program in breast cancer survivors: a randomized controlled trial. *Breast Cancer Res Treat* 2008;**108**:279–288.
4. Adamsen L, Quist M, Andersen C *et al*. Effect of multimodal high intensity exercise intervention in cancer patients undergoing chemotherapy: randomised controlled trial. *BMJ* 2009;DOI: 10.1136/bmj.b3410.
5. Courneya KS, Sellar CM, Stevinson C *et al*. Randomized controlled trial of the effects of aerobic exercise on physical functioning and quality of life in lymphoma patients. *J Clin Oncol* 2009;**27**:4605–4612.
6. Mustian KM, Peppone L, Darling TV, Palesh O, Heckler CE, Morrow GR. A 4-week home-based aerobic and resistance exercise program during radiation therapy: a pilot randomized clinical trial. *J Support Oncol* 2009;**9**:158–167.
7. Segal RJ, Reid RD, Courneya KS *et al*. Randomized controlled trial of resistance or aerobic exercise in men receiving radiation therapy for prostate cancer. *J Clin Oncol* 2009;**27**:344–351.
8. Galvao DA, Taaffe DR, Spry N, Joseph D, Newton RU. Combined resistance and aerobic exercise program reverses muscle loss in men undergoing androgen suppression therapy for prostate cancer without bone metastases: a randomized controlled trial. *J Clin Oncol* 2010;**28**:340–347.
9. Campbell A, Mutrie N, White F, McGuire F, Kearney N. A pilot study of a supervised group exercise programme as a rehabilitation treatment for women with breast cancer receiving adjuvant chemotherapy. *Eur J Oncol Nurs* 2005;**9**:56–63.
10. Mutrie N, Campbell AM, Whyte F *et al*. Benefits of supervisedgroup exercise programme for women being treated for early stage breast cancer: pragmatic randomised controlled trial. *BMJ* 2007;DOI: 10.1136/bmj. 39094.648553.AE.
11. Shelton M, Lee JQ, Morris S *et al*. A randomized control trial of a supervised versus a self-directed exercise program for allogenic stem cell transplant. *Psycho-Oncology* 2009;**18**:353–359.
12. Holmes MD, Chen WY, Feshanich D, Kroenke CH, Colditz GA. Physical activity and survival after breast cancer diagnosis. *JAMA* 2005;**293**:2479–2486.
13. Meyerhardt JA, Giovannucci EL, Holmes MD *et al*. Physical activity and survival after colorectal cancer diagnosis. *J Clin Oncol* 2006;**24**:3527–3534.
14. Meyerhardt JA, Heseltine D, Niedzwieki D *et al*. Impact of physical activity on cancer recurrence and survival in

patients with stage III colon cancer: findings from CALGB 89803. *J Clin Oncol* 2006;**24**:3535–3541.
15. Holick CN, Newcomb PA, Trentham-dietz A *et al*. Physical activity and survival after diagnosis of invasive breast cancer. *Cancer Epidemiol Biomarkers Prev* 2008;**17**: 379–386.
16. Blanchard CM, Denniston MM, Baker F *et al*. Do adults change their lifestyle behaviours after a cancer diagnosis. *Am J Health Behav* 2003;**27**:246–256.
17. Courneya KS, Friedenreich CM. Determinants of exercise during colorectal cancer treatment: an application of the theory of planned behaviour. *Oncol Nurs Forum* 1997;**24**: 1715–1723.
18. Blanchard CM, Courneya KS, Stein K. Cancer survivors' adherence to lifestyle behaviour recommendations and associations with health-related quality of life: results from the American Cancer Society's SCS-II. *J Clin Oncol* 2008;**26**:2198–2204.
19. Kushi LH, Byers T, Doyle C *et al*. American Cancer Society Guidelines on Nutrition and Physical Activity for cancer prevention: reducing the risk of cancer with healthy food choices and physical activity. *CA Cancer J Clin* 2006;**56**:254–281.
20. Haskell WL, Lee I, Pate RR *et al*. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation* 2007;**116**:1081–1093.
21. Daley AJ, Bowden SJ, Rea DW, Billingham L, Carmicheal AR. What advice are oncologists and surgeon in the United Kingdom giving to breast cancer patients about physical activity. *Int J Behav Nutr Phys Act* 2008;**5**:46–69.
22. Clark MM, Vickers KS, Hathaway JC *et al*. Physical activity in patients with advanced-stage cancer actively receiving chemotherapy. *J Support Oncol* 2007;**5**:487–493.
23. Courneya KS, Friedenreich CM, Quinney HA *et al*. A longitudinal study of exercise barriers in colorectal cancer survivors participating in a randomized controlled trial. *Ann Behav Med* 2005;**29**:147–153.
24. Courneya KS, McKenzie DC, Reid RD *et al*. Barriers to supervised exercise training in a randomized controlled trial of breast cancer patients receiving chemotherapy. *Ann Behav Med* 2008;**35**:116–122.
25. Blaney J, Lowe-Strong A, Rankin J, Allen J, Campbell A, Gracey J. The cancer rehabilitation journey: barriers to and facilitators of exercise among patients with cancer-related fatigue. *Phys Ther* 2010;**90**:1135–1147.
26. Rogers LQ, Courneya KS, Robbins KT *et al*. Physical activity correlates and barriers in head and neck cancer patients. *Support Care Cancer* 2008;**16**:19–27.
27. Payne JK. The trajectory of fatigue in adult patients with breast and ovarian cancer receiving chemotherapy. *Oncol Nurs Forum* 2002;**29**:1334–1340.
28. Byar KL, Berger AM, Bakken SL, Cetak MA. Impact of adjuvant cancer chemotherapy on fatigue, other symptoms and quality of life. *Oncol Nurs Forum* 2006;**33**:E18–E26.
29. Prue G, Rankin J, Allen J, Gracey J, Cramp F. Cancer-related fatigue: a critical appraisal. *Eur J Cancer* 2006;**42**: 846–863.
30. Beisecker A, Cook MR, Ashworth J *et al*. Side effects of adjuvant chemotherapy: perceptions of node-negative breast cancer patients. *Psycho-Oncology* 1997;**6**:85–93.
31. Bower JE, Ganz PA, Desmond KA, Rowland JH, Meyerowitz BE, Belin TR. Fatigue in breast cancer survivors: occurrence, correlates and impact on quality of life. *J Clin Oncol* 2000;**18**:743–753.
32. Cella D, Davis K, Breitbart W, Curt G. Cancer-related fatigue:prevalence of proposed diagnostic criteria in a United States sample of cancer survivors. *J Clin Oncol* 2001;**14**: 3385–3391.
33. Dimeo F. Effects of exercise on cancer-related fatigue. *Cancer* 2001;**92**:1689–1693.
34. Gupta D, Lis CG, Grutsch JF. The relationship between cancer-related fatigue and patient satisfaction with quality of life in cancer. *J Pain Symptom Manage* 2007;**34**: 40–47.
35. Rogers LQ, Courneya KS, Shah P, Dunnington G, Hopkins-Price P. Exercise stage of change, barriers, expectations, values and preferences among breast cancer patients during treatment: a pilot study. *Eur J Cancer Care* 2007;**16**: 55–66.
36. Jones LW, Guill B, Keir ST *et al*. Exercise interest and preferences among patients diagnosed with primary brain cancer. *Support Care Cancer* 2007;**15**:47–55.
37. Jones LW, Courneya KS. Exercise discussions during cancer treatment consultations. *Cancer Pract* 2002;**10**: 66–74.
38. Rogers LQ, Malone J, Rao K *et al*. Exercise preferences among patients with head and neck cancer: prevalence and associations with quality of life, symptom severity, depression and rural residence. *Head Neck* 2009;**31**: 994–1005.
39. Rogers LQ, Markwell SJ, McAuley E, Courneya KS. Rural breast cancer survivors: exercise preferences and their determinants. *Psycho-Oncology* 2009;**18**:412–421.
40. Stevinson C, Capstick V, Schepansky A *et al*. Physical activity preferences of ovarian cancer survivors. *Psychooncology* 2009;**18**:422–428.
41. Karvinen KH, Courneya KS, Campbell KL *et al*. Exercise preferences of endometrial cancer survivors. *Cancer Nurs* 2006;**29**:259–265.
42. Vallance JKH, Courneya KS, Jones LW, Reiman T. Exercise preferences among a population-based sample of non-Hodgkin's lymphoma survivors. *Eur J Cancer Care* 2006;**15**:34–43.
43. Markes M, Brockow T, Resch KL. Exercise for women receiving adjuvant therapy for breast cancer. *Cochrane Database Syst Rev* 2006; (4). Art. No.: CD005001. DOI: 10.1002/145651858.CD005001.pub2.
44. Stein KD, Martin SC, Hann DM, Jacobsen PB. A multidimensional measure for fatigue in cancer patients. *Cancer Pract* 1998;**6**:143–152.
45. Aaronson NK, Ahmedzai S, Bergman B *et al*. The European organisation for research and treatment of cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. *J Natl Cancer Inst* 1993;**85**: 365–376.
46. Godin G, Shepard RJ. A simple method to assess exercise behaviour in the community. *Can J Appl Sport Sci* 1985;**10**:141–146.
47. Dillman DA. *Mail and telephone surveys: the total design method*. Wiley: USA, 1978.
48. Fayers PM, Machin D. *Quality of life: the assessment, analysis and interpretation of patient-reported outcomes*. Wiley: England, 2008.
49. National Comprehensive Cancer Network, Inc. NCCN Clinical practice guidelines in oncology–V.1.2010: Cancer-related fatigue. Available from: http://www.nccn.org/professionals/physician_gls/PDF/fatigue.pdf [Accessed 8th August 2010].
50. Stone P, Richardson A, Ream E, Smith GA, Kerr DJ, Kearney N. Cancer-related fatigue: inevitable, unimportant and untreatable? Result of a multi-centre patient survey. *Ann Oncol* 2000;**11**:971–975.
51. Passik SD, Kirsh KL, Donaghy K *et al*. Patient-related barriers to fatigue communication: initial validation of the fatigue management barriers questionnaire. *J Pain Symptom Manage* 2002;**24**:481–493.
52. Shun SC, Lai YH, Hsiao FH. Patients-related barriers to fatigue communication in cancer patients receiving active treatment. *Oncologist* 2009;**14**:936–943.
53. Donnelly CM, Lowe-Strong A, Rankin JP, Campbell A, Allen JM, Gracey JH. Physiotherapy management of

DOI: 10.1002/pon

cancer-related fatigue: a survey of UK current practice. *Support Care Cancer* 2010;**18**;817–825.
54. Irwin ML, McTiernan A, Bernstein L *et al*. Physical activity levels among breast cancer survivors. *Med Sci Sports Exerc* 2004;**36**:1484–1491.
55. Stevinson C, Steed H, Faught W *et al*. Physical activity in ovarian cancer survivors: associations with fatigue, sleep, and psychosocial functioning. *Int J Gynaecol Cancer* 2009;**19**:73–78.
56. Jones LW, Courneya KS, Fairey AS, Mackey JR. Effects of an oncologist's recommendation to exercise on self-reported exercise behaviour in newly diagnosed breast cancer survivors: a single-blind, randomized controlled trial. *Ann Behav Med* 2004;**28**:105–113.
57. Maddams J, Brewster D, Gavin A *et al*. Cancer prevalence in the United Kingdom: estimates for 2008. *Br J Cancer* 2009;**101**:541–547.

DOI: 10.1002/pon